KINESTHETICS AND THE EFFECTS ON CLASSROOM TEST SCORES

MASTER'S PROJECT

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DEDICATION

This study is dedicated to my family, for without their support in many areas, this study and my master's project would not have been possible.

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The writer would like to thank Dr. Calvin Dill from the University of Dayton for his time, patience and guidance during the writing of this thesis.

Thanks to my husband and children for their support, my family for their financial support and my in-laws for watching my children. I could not have done this without all of you.

Thanks to Rick Hampton for his last minute statistical assistance that enabled me to graduate on time.

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ABSTRACT

HAMPTON, KIMBERLY A.

KINESTHETICS AND THE EFFECTS ON CLASSROOM TEST SCORES (pp. 29), June 1997

Faculty Advisor: Calvin F. Dill, Ph.D.

PROBLEM. Teaching children to be successful in the classroom is every teacher's goal, especially when it comes to taking tests. Since the movement to statewide proficiency testing, teachers are feeling the heat even more for children to succeed. The purpose of this study was to determine if children who were taught kinesthetically could improve test scores.

PROCEDURE. A search of related literature of kinesthetics, movement in learning, and brain hemisphere preference was completed. A quasi-experimental study was done to show a relationship between students who were taught kinesthetically and traditionally and their test scores in math. T-tests were completed to determine if a significant difference was present between the two groups on a test score.

FINDINGS. A significant difference was present between the pretest and posttest of the control group, as well as between the pretest and posttest of the treatment group. Overall, the mean score on the pretest was 60.16% and the mean score on the posttest was 83.33%. The mean score of the control group's pretest was 57% and the posttest was 84%. The mean score of the treatment group's pretest was 63% and the posttest was 82%.

CONCLUSIONS AND RECOMMENDATIONS. When comparing the students together as one group taking a pretest and posttest, there was a significant difference between the pretest and posttest scores. However, when those comparisons were broken down between the control group and treatment group, there was a significant difference in both groups between the pretest and posttest scores. The results of this study showed that there was a positive relationship between the treatment group that had kinesthetic teaching and tests, but that there was also a positive relationship between the control group who was taught traditionally and their tests. Due to the fact that research indicates many people are kinesthetic learners, a kinesthetic approach should continue to be taken, combined with traditional teaching, to reach all learning modalities.

CHAPTER I
INTRODUCTION

Purpose for the Study

Does kinesthetics have any effect upon students' test scores? Kinesthetic learning combines the best of John Dewey's philosophy and Maria Montessori's philosophy. Dewey believes that the teacher is the stimulator of learning in the classroom and the teacher must help students to develop their own resources. The teacher's role is more than just to force facts, information and skills on the students. Dewey believes that the teacher must make every effort to help students be active participants in their own learning. Maria Montessori also believes that the teacher is a stimulator of student learning. Montessori feels that each child possesses the power to teach himself (Grant, 1985). Howard Gardener's research on multiple intelligences has led to the identification of seven intelligences in every person. One of the seven intelligences identified is referred to as "bodily/kinesthetic". It has been through Gardener's research that scientists and educators are taking another look at the way teachers teach and the way students learn. While educators have been aware for some time of the different modalities in which children learn, ie: auditory, visual, and tactile, another modality has been added which is kinesthetic learning. Kinesthetic learners seem to learn best through movement and direct experience (Wallace, 1995). As teachers we have learned that some children learn by listening (auditory), some learn best by seeing (visual), some learn best by touching or manipulating (tactile). However,

educators have failed to acknowledge the learner that learns best through whole-body movement--the kinesthetic learner. In 1989, Dunn & Dunn completed research showing the percentages of children with these four learning styles. Their research showed that 8.4 % of learners do so auditorily, 41.4% are visual learners, 20.4% are tactile learners, and 29.8 % learn kinesthetically. Their research also showed that many students who were labeled as poor achievers were actually tactile and/or kinesthetic learners (Dunn & Dunn, 1989). Most teachers teach to the visual and auditory learner. This study will determine if teaching kinesthetically will improve math test scores in a third grade classroom.

Problem Statement

In order to understand how kinesthetics works, one must have an understanding of how the brain processes information. Each hemisphere is responsible for different thinking skills. Some people have a brain hemisphere that is dominant or more controlling than the other. This is referred to as being right brained or left brained. Paul and Lois Dennison have developed kinesthetic exercises to help integrate the right and left hemispheres of the brain. Understanding that students with right, left, and integrated brain hemispheres process information differently is of utmost importance to classroom teachers. A brain which has a hemisphere that is superior to the other learns differently. By integrating both hemispheres so that neither side is dominant, but working together, the learner has a better, more complete process of thinking and learning (Fountain and Fillmer, 1987). While most educators will not debate the idea that there is a difference in what is processed in each hemisphere, there is debate as to what method or methods

can integrate these hemispheres, therefore, making the attainment of learning more accessible to more students. Judith Reiff studied kinesthetic use in the classroom. She came to the conclusion that when teachers concentrate on other modalities, kinesthetic learners tend to fall behind and drop in self esteem. Reiff also discovered that many students have been inappropriately labeled as hyperactive and are really gifted kinesthetic learners (Reiff, 1992). Every child is different, every classroom is different. Once teachers come to the realization that there are kinesthetic learners in the classroom, kinesthetic teaching is endless. As to what works best, it will depend on the teacher and the students. This study will determine if kinesthetic teaching methods will improve third grade math test scores.

Hypothesis

There is a positive relationship between teaching kinesthetically and third grade math test scores.

Limitations

One limitation in this study will be the differences in children. Although these students have the same teacher and have been under the same instruction, all students have different attitudes towards the subjects and the exercise. Another limitation is that some students may not be kinesthetic learners and may or may not show any improvement in test scores. Giving pretests and posttests may be a limitation to validity in this study.

Definitions

Auditory learners prefer to use their voices and ears to learn. They remember what they say aloud and what they hear. These learners love class discussion. They thrive on working and talking with others (Wallace, 1995).

Haptic processing refers to the integration of touch and body movement (Chalfant and Scheffeling, 1969).

Kinesthetic learners learn best through whole-body involvement and direct experience.

Learning modality is the sensory channels or pathways through which individuals give, receive, and store information. Perception, memory and sensation comprise the concept of modality (Reiff).

Tactile learner refers to a person that learns best by touching or manipulating in some way: coloring, making, drawing, building or putting things together (Wallace,1995).

Visual learners are able to process information by seeing it. They like to receive information in the form of pictures, graphs, diagrams, and videos. They frequently close their eyes to reassemble a picture of what they are trying to remember (Wallace, 1995).

Whole brain refers to the idea that neither side is superior to the other, but work together and are essential to integrated thinking (Fountain and Fillmer, 1987).

CHAPTER II
REVIEW OF RELATED LITERATURE

There is a call for further research in this area of learning modalities. Research done with children shows that movement stimulates brain development and draws upon the multiple intelligences as described by Howard Gardener (Kim, 1995). With the labeling of ADD and ADHD on so many children in the past 5-10 years, teachers must rethink teaching strategies in the hopes that more children can be reached and that more students can be productive in the classroom and carry that productivity to their adult lives. Imagine the frustration of a student who is a tactile or kinesthetic learner and is forced to sit and listen to lecture. Are we as educators ignoring this student's learning style modality?

Before kinesthetics can be defined and understood, perhaps it would be beneficial to first discuss hemispheric brain preference. Fountain and Fillmer have done tremendous research in hemispheric brain preference.

The brain has two hemispheres and each is responsible for the processing of different information. The right hemisphere specializes in processing spatial, visual, movement, and touch stimuli in terms of patterns and relationships. The left hemisphere specializes in processing linguistic stimuli in terms of time, details, and sequence. (Fountain and Fillmer, 1987). Learning is generally accomplished through the left hemisphere, the right hemisphere or the successful integration of both as a matter of individual differences. If neither side of the brain is allowed to develop fully, the

potential of either hemisphere remains dormant. The highest potential is achieved when both hemispheres are working to their peak capacity and the information from both is integrated into a whole (Fountain and Fillmer, 1982). There is general agreement among educators that there has been more stress on the more measurable left hemisphere which controls mathematical and verbal skills sometimes referred to as "the basics" than on the less measurable right hemisphere which controls intuitive creative thinking skills. This overemphasis on left hemispheric activities probably comes from the public's demand for more attention to the basic skills of reading, writing and mathematics. Research has shown, however, that the two halves are specialized for different cognitive functions, but the continued use of either hemisphere to the exclusion of the other hemisphere. can cause people to rely too heavily on either left or right thinking and excluding the other hemisphere (Fountain and Fillmer, 1982). Webb in 1982, suggested that students who fail in school exhibited characteristics associated with right brain learning. Eisner pointed out that students who have not learned to explore visually and mentally the forms of nature, art and science will not be able to write, not because they can't compose, but because they have nothing to say. The results of this research substantiate the fact that students do have different learning styles related to their preferred hemisphere of brain processing.

This is where kinesthetics comes in to play. Kinesthetics describes muscular movement in response to visual, auditory, and tactile stimulation. It is movement designed to teach a concept. This teaching method combines the best of John Dewey and

Maria Monetessori. Dewey firmly believed that the educator must stimulate children to find and develop their own resources, not to gorge them with mere information and skills. The teacher should be the motivator and should encourage students to be active participants in their own education (Grant, 1985).

While the kinesthetics approach is not new, it is not exclusively Dewey's either. Montessori also believed that the key to learning is the students and the teacher acts as the stimulator. Most teachers don't realize that physical movement triggers extensive activity in the brain's cerebral cortex and motor cortex. Stimulated by movement, the cerebral cortex acts as a perceptual feedback system that sends information to and receives information from the spinal cord; the motor cortex sends signals to tell the body how to move (Houston, 1982). Promoting this mind- body connection is a sure-fire way to achievement for many students. Schools that insist children must sit still for most of the day deny the connections between movement and learning (Houston, 1982). Schools still think wriggling and squirming kids must be brought into line and disciplined if they obey their natural inclination to move.

Current instructional practices are dominated by lecture and individual seatwork. Students are required to be passive, silent, and isolated. Ninety percent of instruction occurs through lecture and question and answer method (Dunn & Dunn, 1993). Learning style, according to Dunn and Dunn, is comprised of the conditions under which a student begins to concentrate on, absorb, process, and retain new or difficult information or skills. It is a composite of an individual's environment, emotional , sociological, physical and psychological trains. Learning through the auditory, visual, tactile, or kinesthetic

senses are elements of the physical stimulus and represent an individual's preference for sensory channels through which to give and receive information (Dunn and Dunn, 1993). The learning styles discussed are auditory learners who prefer to use their voices and ears to learn. They remember what they hear and they love class discussion. These learners thrive on working and talking with others. Visual learners prefer to process information by seeing it. These learners frequently close their eyes to reassemble a picture of what they are trying to remember. Tactile learners learn better when they have the opportunity to touch or manipulate objects in some way. Often tactile learners love to use the computer. Kinesthetic learners seem to learn best through whole body involvement and direct experience. They want to be as active as they can. Role playing, field trips, becoming physically involved accommodate these learners. Research has shown that students who achieve well in school are the visual or auditory learners. It should come as no surprise then that these learners do well on tests. What has come as a surprise is that students who are poor achievers are actually tactile and/or kinesthetic learners (Dunn and Dunn, 1993). In the US, 30% of students are actually tactile or kinesthetic learners (Dunn and Dunn, 1989). Dunn and Dunn feel that in some people, the modality preference is so slight that it's almost discernible. For others this preference is quite pronounced. Judith Reiff in 1992 studied kinesthetic use in the classroom. She came to the conclusion that when teachers concentrate on the other modalities, kinesthetic learners tend to fall behind, drop in self-esteem and tend to view the school system as antagonistic. Another study by Donna Corlett in 1992 supports the Reiff study by indicating that many at-risk students have not been taught with the strategies, methods,

materials that accommodate their learning style preferences and strengths (Corlett, 1992). Judith Reiff also states that many students have been inappropriately labeled as hyperactive and are really gifted kinesthetic learners. Barbe and Malone argue that most curriculum is geared toward the visual and auditory learner. They believe that if the curriculum is set up in this manner, it is the teacher's responsibility to adapt it to meet the modalities of all children. "After all, if we teach the same way all the time, then we are consistently denying the same set of students the education which they deserve." (Barbe and Malone, 1980.) An advantage to implementing a kinesthetic approach is that usually the other modalities are involved as well (Gage, 1995). A concept called "body gym" or "brain gym" has been designed by Paul and Gail Dennison. It is an exercise program that helps the brain's hemispheres learn to work together with the hopes of achieving integration of the hemispheres. Exercises that force the student to cross the midline of the body such as crossing one's ankles and touching the floor, crossing the arms and skip counting help to integrate these hemispheres. Students that have trouble concentrating can be taught to do these exercises. Staring at an X on the wall or chalkboard, sitting with ankles crossed can help with concetration in the classroom. Colors are even being researched to see if certain ones make a difference for students. It has been found that hot pink paper placed on a desk can help some ADD students focus better.

These exercises are fine to teach students how to help themselves. But what about curriculum? How can kinesthetics be used to teach the curriculum? How can we as educators adapt the curriculum we are using to meet all learning style modalities, especially the kinesthetic learner? Kinesthetic learners tend to learn best through active

involvement with their bodies. Activities such as role playing, field trips, forming letters of the alphabet with their bodies (Marlowe, 1988), body games, making mobiles, drawing portraits of characters from the reading text, drawing out and/or acting out math problems, teaching multiplication and long division using one's fingers (Chalfant and Scheffeling, 1969), teaching parts of speech through movement and acting, using dance to teach symmetry and basic math operations are all examples. Much of a school's curriculum can be taught kinesthetically. It is important to re-emphasize that when kinesthetics is being used to teach, other modalities are being used also. We just don't give up on the visual, auditory and tactile learners.

Science concepts of metamorphosis can be taught using kinesthetics. Children act out each stage, from egg to larva to pupa to adult. Transportation in social studies can be taught kinesthetically as students pick a form of transportation and move in their chosen form. Language Arts topic of sign language can be taught using exaggerated body movements, made up by students. Students teach to class and class repeats. Literature can also be taught kinesthetically. Students pick key words such as nouns, verbs, etc., and create a movement for one key word. As the class reads the passage aloud, the key word is acted out.

As stated before, the use and usefulness of kinesthetics in the classroom has endless possibilities.

CHAPTER III
METHODOLOGY

Population

The population of this study was approximately 100 third grade students attending a suburban public elementary school. The sample subjects of this study are an intact heterogeneously grouped class of 24 third grade students. They have had the same teacher since the beginning of the school year. The entire building population is approximately 525 students in grades K-4.

Design

The design for this study is quasi-experimental research using a randomized control group within the intact group, pretests and posttests.

Data and Instrumentation

The instruments used in this study are teacher made pretests and posttests. Each test will be given to the control group and the experimental group. The difference between pretests and posttests will be tabulated and averaged. The mean difference will be tabulated. A comparison will be made to the averages between the control and treatment group.

Threats to Internal and External Validity

Threats to Internal Validity	Control
history	shortening the duration of the experiment
maturation	shortening experiment duration
testing	control time between tests
instrumentation	same teacher will give pretest and posttest
statistical regression	randomly assign group
differential selection of subjects	groups are randomly selected, not by achievement
experimental mortality	all subjects participate

Threats to External Validity	Controls
interaction effect of testing	reduce time between pretest and posttest; give different questions on each test
interaction effects of selection biases	randomly assign
reactive effects of experimental arrangements	do not let students know when they are being tested
multiple treatment inference	spread time between treatments

CHAPTER IV
RESULTS

TABLE I
PRETEST GRADES FOR ALL STUDENTS

Grade Range	Letter Grade	n	%
100 - 90	A	0	0
89 - 80	B	3	14
79 - 70	C	8	33
69 - 60	D	4	16
Below 59	F	9	37
TOTAL		24	100

MEAN = 60.16 MEDIAN = 68 MODE = 72 SD = 19.36305

TABLE II
POSTTEST GRADES FOR ALL STUDENTS

Grade Range	Letter Grade	n	%
100 - 90	A	11	46
89 - 80	B	5	21
79 - 70	C	3	13
69 - 60	D	4	16
Below 59	F	1	4
TOTAL		24	100

MEAN = 83.33 MEDIAN = 88 MODE = 92 SD = 13.17

TABLE III
PRETEST SCORES FOR CONTROL GROUP AND TREATMENT GROUP

Grade Range	Control Group		Treatment Group		Total	
	n	%	n	%	n	%
100 - 90	0	0	0	0	0	0
89 - 80	2	17	1	8	3	12
79 - 70	3	25	5	42	8	33
69 - 60	1	8	3	25	4	17
Below 59	6	50	3	25	9	38
TOTAL	12	100	12	100	24	100

TABLE IV
POSTTEST SCORES FOR CONTROL GROUP AND TREATMENT GROUP

Grade Range	Control Group		Treatment Group		Total	
	n	%	n	%	n	%
100 - 90	5	42	6	50	11	46
89 - 80	3	25	2	17	5	21
79 - 70	0	0	3	25	3	12
69 - 60	3	25	1	8	4	17
Below 59	1	8	0	0	1	4
TOTAL	12	100	12	100	24	100

TABLE V
DIFFERENCES BETWEEN PRETEST AND POSTTEST MATH SCORES FOR ALL THIRD GRADE STUDENTS

t	Probability	Significance
8.61	.0001	*

* < .05 Pretest = 60.17 Posttest = 83.33

Table V shows the difference between pretest and posttest math scores for the 24 third grade students participating in the study. Using a t-test, a significant difference was established. The mean posttest score of 83.33 indicates higher scores were obtained from the pretest score (60.17) at the beginning of the study.

TABLE VI
DIFFERENCES BETWEEN PRETEST AND POSTTEST MATH SCORES FOR CONTROL GROUP OF THIRD GRADE STUDENTS

t	Probability	Significance
6.5876	0.00001	*

TABLE VII
DIFFERENCES BETWEEN PRETEST AND POSTTEST MATH SCORES FOR TREATMENT GROUP OF THIRD GRADE STUDENTS

t	Probability	Significance
5.4390	0.0001	*

CHAPTER V
SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Problem Statement

In order to understand how kinesthetics works, one must have an understanding of how the brain processes information. Each hemisphere is responsible for different thinking skills. Some people have a brain hemisphere that is dominant or more controlling than the other. This is referred to as being right brained or left brained. Paul and Lois Dennison have developed kinesthetic exercises to help integrate the right and left hemispheres of the brain. Understanding that students with right, left, and integrated brain hemispheres process information differently is of utmost importance to classroom teachers. A brain which has a hemisphere that is superior to the other learns differently. By integrating both hemispheres so that neither side is dominant, but working together, the learner has a better, more complete process of thinking and learning (Fountain and Fillmer, 1987). While most educators will not debate the idea that there is a difference in what is processed in each hemisphere, there is debate as to what method or methods can integrate these hemispheres, therefore, making the attainment of learning more accessible to more students. Judith Reiff studied kinesthetic use in the classroom. She came to the conclusion that when teachers concentrate on other modalities, kinesthetic learners tend to fall behind and drop in self esteem. Reiff also discovered that many students have been inappropriately labeled as hyperactive and are really gifted kinesthetic learners (Reiff, 1992). Every child is different, every classroom is different.

Once teachers come to the realization that there are kinesthetic learners in the classroom, kinesthetic teaching is endless. As to what works best, it will depend on the teacher and the students. This study will determine if kinesthetic teaching methods will improve third grade math test scores.

Hypothesis

There is a positive relationship between teaching kinesthetically and third grade math test scores.

Summary

Twenty-four students participated in this study. On the whole, most appeared to do much better on the posttest than pretest. The concept taught was a new concept, it had not been introduced at all this school year. On the pretest, more than half of all the students were below a C average. On the posttest, more than half of all the students were above a C average. When looking at the control group and treatment group separately on the pretest, the control group had more than half below a C average. The treatment group had exactly half below a C average on the pretest. When the posttest was given, the control group showed improved grades with two-thirds above a C average. The treatment group also improved with two -thirds above a C average. The two-thirds that showed improvement was distributed differently along the grading scale.

Conclusions

1. All students improved between the pretest and the posttest.
2. On the control group, the lowest number of points that students improved were 12

and the highest was 48. On the treatment group, the lowest number of points of improvement was 4 and the highest was 52.

3. Of the two students who achieved 100% on the posttest, one was from a control group and one from the treatment group.

4. The average number of improvement points in the control group was 24. The average number of improvement points in the treatment group was 21.

Implications

Both groups had success possibly because this was the last test of the year. During the year, students were taught mathematics using various methods of instruction. For this test, the treatment group was strictly taught using kinesthetics, while the control group was taught in the same manner as they had been instructed all year. This researcher believed the kinesthetic method would have proven more effective if this study had been done at the beginning of the year when students are fresh to the classroom and the teacher and have not adapted to the method of teaching. It is possible that kinesthetic learners in the classroom have learned survival techniques for test-taking and regular classroom work. It is also possible that there were a limited number of kinesthetic learners in this class.

Recommendations

Even though both groups were successful and the t-tests for both groups were significant, the results would have probably been more in favor of kinesthetics if tested at the beginning of the year. The results of this study should not discourage teachers from trying to teach to the kinesthetic learners. This study does seem to back up the research

that states kinesthetic teaching involves all learning modalities. That is possibly why each group was successful.

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